REMARKS

Status of the claims:

With the above amendments, claims 1, 3-5, 7, 8, 11, 15, 16, and 19-21 have been canceled and claims 22-33 have been added. Claims 1, 3-5, 7, 8, 11, 15, 16, and 19-21 are the same as claims 22-33, with several small changes. Attached to the back of this response show how the claims have been amended (see Appendix A). Thus, claims 22-33 are pending and ready for further action on the merits. No new matter has been added by way of the above amendments. Support for the amendments to old claims 1 and 11 (new claims 22 and 28, respectively) can be found at page 3, lines 18-24. Reconsideration is respectfully requested in light of the following remarks.

Examiner Interview

Applicants' representative would like to thank the Examiner for taking the time to interview on June 30, 2004. The gist of the interview is as indicated on the Interview Summary form.

Rejections under 35 USC §§102/103

Claims 1, 3, 5-8, 11, 16 and 19-21 have been rejected under 35 USC §102(b) as being anticipated by, or alternatively, under 35 USC §103(a) as being unpatentable over Cash '203 (US Patent No. 4,430,203).

Claims 4 and 15 have been rejected under 35 USC §102(b) as being unpatentable over Cash '203 (US Patent No. 4,430,203) in view of Graziani '364 (US Patent No. 4,695,364).

Applicants traverse.

New Claims

Applicants draw the Examiner's attention to the fact that none of the above rejected claims are now pending. As was pointed out above, new claims 22-33 correspond to old claims 1, 3-5, 7, 8, 11, 15, 16, and 19-21, respectively. Applicants, below, explain how the new claims (*i.e.*, 22-33) are patentable over the cited art.

Present Invention

The present invention, as recited in claim 22, relates to a hydrorefining unit for hydrorefining hydrocarbon feed oil including sulfur-containing compounds, comprising:

a first catalyst layer and a second catalyst layer;

a holding member positioned between the first catalyst layer and second catalyst layer for temporarily holding a liquid component that flows out from the first catalyst layer;

a hydrogen feed source;

a hydrogen introduction part, that is connected to the hydrogen feed source, for simultaneously introducing hydrogen from

the hydrogen feed source to the liquid component held in the holding member and the second catalyst layer;

a separation space that is positioned at the bottom of the first catalyst layer for separation of vapor component and liquid component;

a gas outlet through which the vapor component is discharged from the separation space; and

means for adjusting pressure of the separation space and/or a space between the holding member and the second catalyst layer

wherein the hydrogen introduced from the hydrogen introduction part has a first hydrogen gas stream and a second hydrogen gas stream, and

with the means for adjusting pressure, with the first hydrogen stream passing through the liquid component as a countercurrent to the liquid component that flows out from the first catalyst layer and the second gas stream being introduced to the second catalyst layer as a cocurrent with the liquid component that flows out from the holding member.

Disclosure of Cash '203

Cash '203 discloses a multistage hydrocracking or hydrotreating process wherein a two-phase reaction mixture of a hydrogen rich gas stream and liquid hydrocarbon is passed through a series of spaced catalyst beds and reaction vapors are withdrawn at

each interspace between beds and replaced with hydrogen. Such withdrawal and replacement is said to reduce the partial pressure of NH_3 and/or H_2S in the reaction mixture entering the bed succeeding each interspace, thereby increasing the reaction rate between hydrogen and the liquid hydrocarbon.

Disclosure of Graziani '364

Graziani '364 discloses what is said to be an improved multistage hydrodewaxing process for hydrodewaxing a hydrocarbon feedstock, such as a heavy or light distillate. A two-phase mixture of a hydrogen-rich gas stream and a liquid hydrocarbon is passed through a series of spaced catalyst beds in a single reactor, reaction vapors containing olefins, are withdrawn at each interspace between beds and replaced with hydrogen-rich saturated gas.

Removal of the Rejections over Cash '203 and Graziani '364

Applicants have amended claims 22, 28, and 33 (i.e., old claims 1, 11 and 21, respectively) so that they more closely recite the elements in Figure A that was filed with the response of June 23, 2004. In particular Applicants respectfully submit that the following table indicates what are the claimed elements and where they can be found in Figure A that was filed with the response of June 23, 2004.

Claim Elements	**Units in Figure A**
First catalyst layer	Catalyst in first reactor RT01
Second catalyst layer	Catalyst in second reactor RT02
Holding member	Bottom of TW01
Hydrogen feed source	Not shown (located upstream of the pressure reducing valve connecting lines F05 and F01)
First hydrogen gas stream	Stream from line F05 towards TW01
Second hydrogen gas stream	Stream from line F02 through line L2 towards RT02
Separation space	VE01 and TW01
Gas outlet	Line connected to upper portions of VE01 and TW01
Means for adjusting pressure	Pressure Adjusting valve close to VE02

From this table, it should be apparent to those of ordinary skill in the art that the elements in the claims correspond to the elements that appear in Figure A with the response that was filed on June 23, 2004. In particular, Applicants note that the first intermediate high pressure vessel VE01 is a vessel which temporally stores a liquid component eluted from the first reactor RT01. The high pressure stripping tower TW01 (as appears in Figure A) is a vessel which temporally stores a liquid component. The bottom of the tower TW01 functions as the holding member defined in the claims. In the upper part inside of tower TW01, the hydrogen stream introduced from a line F05 passes through liquid components stored in the tower TW01 as countercurrent to the liquid components.

With respect to Figure A, Applicants direct the Examiner's attention to the fact that a valve that functions to flow the

liquid component directly to line F06 is omitted on the line connecting line F04 and the second intermediate high pressure separation vessel VE02 in Figure A.

Applicants note that Figure A is a schematic diagram of a hydrorefining unit (as was pointed out in the response of June 23, 2004). This unit explains the obtained experimental data of hydrorefining that was submitted with the response of June 23, 2004.

As was explained in the response filed June 23, 2004 with the experimental results set out in Table 1B (also in the June 23, 2004 response), the first unit configuration corresponds to the case where there is no H_2S ventilation separation. The second configuration corresponds to that of Cash '203, and the third configuration corresponds to that of the instantly claimed invention.

In the second unit configuration, the liquid and vapor components eluted out of the first reactor RT01 are fed to the first intermediate high pressure separation vessel VE01 in which the vapor component can be removed, and then passed through the high pressure stripping tower TW01 and lines F04, F05 and L2 into the second reactor RT02. However, in the high pressure stripping tower TW01, the stripping was not performed. No hydrogen was fed from line F05. Rather, hydrogen, which amount corresponds to that removed in the vessel VE01, is fed into the line L2 from the

hydrogen line F02. Please note that this configuration corresponds to Cash '203 because any removed hydrogen from the vessel VE01 is replaced by hydrogen provided by line F02.

In the third unit configuration, the liquid and vapor components eluted out of the first reactor RT01 are fed to first intermediate high pressure separation vessel VE01 in which the vapor components are removed. Specifically, H_2S is separated and then passed through high pressure stripping tower TW01. In the high pressure stripping tower, stripping was performed by feeding hydrogen from line F05 into the stripping tower so that the hydrogen passes through the liquid component as a countercurrent. Applicants respectfully point out that claim 22 (old claim 1) has been amended to reflect this. The liquid component eluted from stripping tower TW01 is passed through lines F04, F06 and L2 into the second reactor RT02. The hydrogen fed from line F05 goes out of stripping tower TW01 through a line L3 after the stripping in the stripping tower TW01. Hydrogen, which amount corresponds to that removed in the vessel VE01, is fed into line L2 from hydrogen line F02.

Hydrorefining of gas oil at the different reaction temperatures of 300, 320, 340 and 360°C in the first reactor using the three different configurations were performed, respectively. The reaction conditions for the three different configurations are indicated in Table 1A as was filed with the response of June 23,

2004. The experimental results are also indicated in Table 1B, Figure B, and Figure C (which shows an enlarged Figure B) from this response. As noted from Table 1B and Figures B and C, the sulfur content in the oil refined by the third configuration (*i.e.*, the instant invention) is substantially lower than that of the second configuration, which corresponds to the method and apparatus of Cash '203, in the temperature range of 320 to 350°C. Thus, the instant invention provides a gas oil that is significantly reduced in sulfur relative to the amount of sulfur that results using the apparatus in Cash '203.

Applicants, herein, also attach a 37 CFR §1.132 declaration executed by Katsuaki Ishida, who performed the above experiments. This declaration refers to the attachments that were submitted with the response of June 23, 2004.

For the above stated reasons, Applicants submit that the rejections over Cash '203, or Cash '203 in view of Graziani '364 are inapposite. All of the features that appear in Figure A that was filed with the response of June 23, 2004 have corresponding elements in the claims. Thus, the instant invention is unexpectedly superior to the method disclosed in Cash '203. For these reasons, withdrawal of the rejections is warranted and respectfully requested.

With the above remarks and amendments, it is believed that the claims, as they now stand, define patentable subject matter such

that passage of the instant invention to allowance is warranted. A Notice to that effect is earnestly solicited.

If any questions remain regarding the above matters, please contact Applicant's representative, T. Benjamin Schroeder (Reg. No. 50,990), in the Washington metropolitan area at the phone number listed below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By Raymond C. Stewart #21,066
for Marc S. Weiner, #32,181

MSW/TBS/mua
2282-0142P

P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

Attachment(s): Declaration under C.F.R. § 1.132
Appendix A showing claim amendments from the response filed June 23, 2004

Appendix A

1. (currently amended) (new claim 22) A hydrorefining unit for hydrorefining hydrocarbon feed oil including sulfur-containing compounds, comprising:

a first catalyst layer and a second catalyst layer;

a holding member positioned between the first catalyst layer and second catalyst layer for temporarily holding a liquid component that flows out from the first catalyst layer;

a hydrogen feed source;

a hydrogen introduction part, that is connected to the hydrogen feed source ~~and that is arranged downstream of the holding member and upstream of the second catalyst layer~~, for simultaneously introducing hydrogen from the hydrogen feed source to the liquid component held in the holding member and the second catalyst layer;

a separation space that is positioned at the bottom of the first catalyst layer for separation of vapor component and liquid component;

a gas outlet through which the vapor component is discharged from the separation space; and

means for adjusting pressure of the separation space and/or a space between the holding member and the second catalyst layer

wherein the hydrogen introduced from the hydrogen introduction part has a first hydrogen gas stream and a second hydrogen gas stream, and

with the means for adjusting pressure, with the first hydrogen stream passing through the ~~holding member~~ liquid component as a countercurrent to the liquid component that flows out from the first catalyst layer and the second gas stream being introduced to the second catalyst layer as a cocurrent with the liquid component that flows out from the holding member.

2. (canceled).

3. (previously presented) (new claim 23) A hydrorefining unit according to claim 1, wherein the first catalyst layer, second catalyst layer, and holding member are housed in a single reaction vessel.

4. (previously presented) (new claim 24) A hydrorefining unit according to claim 1, wherein the holding member is a tray which has a discharge hole for liquid component and in which liquid component accumulates.

5. (previously presented) (new claim 25) A hydrorefining unit according to claim 1, wherein the holding member is a packing material through which liquid component can pass.

6. (canceled).

7. (previously presented) (new claim 26)A hydrorefining unit according to claim 1, wherein impurities are stripped from the liquid component held in the holding member by the first hydrogen gas stream.

8. (previously presented) (new claim 27) A hydrorefining unit according to claim 7, wherein the impurities are hydrogen sulfide and/or ammonia.

9-10. (canceled).

11. (currently amended) (new claim 28) A method for hydrorefining hydrocarbon feed oil including a sulfur-containing compound using at least two catalyst layers, comprising the steps of:

introducing hydrocarbon feed oil to the first catalyst layer together with hydrogen;

temporarily holding, by using a holding member, a liquid component that has flown out from the first catalyst layer, and

stripping the liquid component with a first hydrogen gas stream that is fed from a hydrogen introduction part provided between the first catalyst layer and the second catalyst layer so that the first hydrogen gas stream passes through the liquid component as a countercurrent to the liquid component;

removing a vapor component that has been produced from the first catalyst layer and a vapor component that has been produced by stripping, while adjusting flow of the vapor component produced from the first catalyst layer and the vapor component produced by stripping to perform the stripping; and

introducing the stripped liquid component to the second catalyst layer together with and cocurrent with a second hydrogen gas stream that is fed from the hydrogen introduction part~~; and~~

~~introducing the first hydrogen gas stream and the second hydrogen gas stream between the holding member and the second catalyst layer~~.

12-14. (canceled)

15. (previously presented) (new claim 29) A hydrorefining method according to claim 11, wherein the holding member is a tray which has a liquid discharge hole and in which liquid component accumulates.

16. (previously presented) (new claim 30) A hydrorefining method according to claim 11, wherein the holding member is a packing material through which the liquid component can pass.

17-18. (canceled)

19. (previously presented) (new claim 31) A hydrorefining method according to claim 11, wherein the hydrocarbon feed oil is hydrocarbon oil in which 90 vol% distillation temperature is 250°C or higher.

20. (previously presented) (new claim 32) A hydrorefining method according to claim 11, wherein the hydrocarbon feed oil has a 10 vol% distillation temperature of 220 to 300°C and a 90 vol% distillation temperature of 320 to 380°C, and the hydrorefined hydrocarbon feed oil has a sulfur content of not more than 150 ppm.

21. (currently amended) (new claim 33) A hydrorefining unit for hydrorefining hydrocarbon feed oil including sulfur-containing compounds, comprising:

a first catalyst layer and a second catalyst layer;

a holding member positioned between the first catalyst layer and second catalyst layer for temporarily holding a liquid component that flows out from the first catalyst layer;

a hydrogen feed source;

a hydrogen introduction part, that is connected to the hydrogen feed source ~~and that is arranged downstream of the holding member and upstream of the second catalyst layer~~, for simultaneously introducing hydrogen from the hydrogen feed source to the liquid component held in the holding member and the second catalyst layer;

a separation space that is positioned at the bottom of the first catalyst layer for separation of vapor component and liquid component;

a gas outlet through which the vapor component is discharged from the separation space; and

wherein the separation space and/or a space between the holding member and the second catalyst layer can have its pressure adjusted.

PATENT
2282-0142P

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant:	Hiroki KOYAMA et al.	Conf.: 8879	
Appl. No.:	09/889,241	Group: 1764	
Filed:	July 13, 2001	Examiner:	NORTON, N.G.
For:	HYDROREFINING APPARATUS AND METHOD		

Declaration Under 37 C.F.R. § 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Katsuaki Ishida, declare and state

1) I am familiar with the Office Action dated January 23, 2004.

2) I am an employee of Japan Energy Corporation who has the responsibility of continuing with the inventive hydrorefining unit of the above-identified application.

3) The following experiments were performed by me or under my control.

4) The attached Figure A is a schematic diagram of a hydrorefining unit. This unit helps explain the obtained experimental data of hydrorefining as presented in attached Table 1B and figures B and C. The unit has mainly a first reactor RT01, a second reactor RT02, a first intermediate high pressure separation vessel VE01 (ventilation vessel) wherein vapor phase is removed, and a high pressure stripping tower TW01 wherein the stripping is performed.

5) Experiments for hydrorefining gas oil as feed oil have been made with three different unit configurations.

In the first unit configuration, the output line L1 of the first reactor RT01 directly communicates with an input line L2 of the second reactor RT02 by closing a valve V1 between the first reactor RT01 and the first intermediate high pressure separation vessel VE01. Hydrogen is fed into the line L2 from a hydrogen feeding line F02.

In the second unit configuration, the liquid and vapor components eluted out of the first reactor RT01 are fed to the first intermediate high pressure separation vessel VE01 in which the vapor component can be removed, and then passed through the high pressure stripping tower TW01 and lines F04, F05 and L2 into the second reactor RT02. However, in the high pressure stripping tower TW01, the stripping was not performed. No hydrogen was fed from line F05. Rather, hydrogen, which amount corresponds to that removed in the vessel VE0l, is fed into the line L2 from the hydrogen line F02. Please note that this configuration corresponds to Cash '203 because any removed hydrogen from the vessel VE01 is replaced by hydrogen provided by line F02.

In the third unit configuration, the liquid and vapor components eluted out of the first reactor RT01 are fed to first intermediate high pressure separation vessel VE01 in which the vapor components are removed. Specifically, H_2S is separated and then passed through high pressure stripping tower TW01. In the high pressure stripping tower, stripping was performed by feeding hydrogen from line F05 into the stripping tower so that the hydrogen passes through the liquid component as a countercurrent. The liquid component eluted from stripping tower TW01 is passed through lines F04, F06 and L2 into the second reactor RT02. The hydrogen fed from line F05 goes out of stripping tower TW01 through a line L3 after the stripping in the stripping

tower TW01. Hydrogen, which amount corresponds to that removed in the vessel VE01, is fed into line L2 from hydrogen line F02. Please note that this configuration corresponds to the inventive unit of the instant invention.

6) Hydrorefining of gas oil at the different reaction temperatures of 300, 320, 340 and 360°C in the first reactor using the three different configurations were performed, respectively. The reaction conditions for the three different configurations are indicated in Table 1A. Moreover, the experimental results are also indicated in Table 1B, Figure B, and Figure C (which shows an enlarged Figure B).

7) As noted from Table 1B and Figures B and C, the sulfur content in the oil refined by the third configuration (*i.e.*, the instant invention) is substantially lower than that of the second configuration, which corresponds to the method and apparatus of Cash '203, in the temperature range of 320 to 350°C.

8) Thus, the instant invention provides a gas oil that is significantly reduced in sulfur relative to the amount of sulfur that results using the apparatus in Cash '203.

I hereby declare all statements made herein of my own knowledge are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment or both under 18 USC §1001, and that such willful false statements may jeopardize the validity of the application or any patent that issues therefrom.

Katsuaki Ishida

Katsuaki Ishida

July 15, 2004

Date